REMOVAL AND DISPOSAL REPORT
X-208 through X-210 Test Cells and Exhauster Tunnels

Pratt & Whitney
Andrew Willgoos Turbine Laboratory
Pent Road
East Hartford, Connecticut

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Prepared for

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ACRONYMS

CFR	Code of Federal Regulations
CTDEEP	Connecticut Department of Energy & Environmental Protection
EPA	United States Environmental Protection Agency
LEA	Loureiro Engineering Associates, Inc.
MSL	Mean Sea Level
P&W	Pratt & Whitney
PCB	Polychlorinated Biphenyl
RCSA	Regulations of Connecticut State Agencies
RCRA	Resource Conservation and Recovery Act
UIS	United Industrial Services, Inc.

UNITS

mg/kg	Milligrams per Kilogram

1. INTRODUCTION

Pratt & Whitney retained Loureiro Engineering. Associates, Inc. (Loureiro) to document the removal activities of polychlorinated biphenyls (PCBs) containing caulk and mastic as well as PCB-impacted concrete located within the X-208 through X-210 test cells and exhauster tunnels (hereinafter referred to as the "Project Area") at the Pratt & Whitney Andrew Willgoos Turbine Laboratory (Willgoos) (hereinafter referred to as the "Site") located at One Pent Road, East Hartford, Connecticut. The activities described herein were performed within the former ground level slabs and subsurface exhaust structures of the specified test cells of the Willgoos facility. A Site Location Map is provided as Figure 1-1. The Owner of the Site is Pratt & Whitney, a United Technologies Corporation (UTC) Company. The subject area for this document is the X-208 through X-210 test cell ground level slabs and exhauster tunnels and a conjoined basement area of the X-210 test cell, which underlies the main Willgoos building. Figure 1-2 provides a site plan showing the Project Area Location at the Site.

1.1 Purpose and Scope

The main portion of the Willgoos facility has undergone demolition and PCB-containing building materials (i.e., caulk and paint) and PCB-impacted concrete that have been encountered have been managed by Pratt & Whitney as a bulk product waste following the requirements of Title 40 of the Code of Federal Regulations (CFR) Parts 761.60 and 761.62 or were removed as PCB remediation waste as part of a performance-based disposal activity pursuant to 40 CFR Part 761.61(b).

The overall remedial objective was to address the building materials, concrete walls and concrete slabs within the Project Area that contained or were impacted by PCBs. The selected approach was to physically remove from the Project Area, and properly dispose of building materials and concrete impacted with PCB concentrations in excess of 1 milligram per kilogram (mg/kg) for the locations within four feet of the ground surface and in excess of 10 mg/kg for the locations at depths greater than four feet of the ground surface.

The removal approach was designed to effectively remove building materials impacted with PCBs at concentrations in excess of the applicable criteria via methods such as demolition and offsite disposal and dry scarification and offsite disposal. For building structures located above ground surface the general approach for removal was demolition and offsite disposal. For building structures and materials located at or below ground surface the general approach for removal consisted of dry scarification and offsite disposal with some situations resulting in complete removal by demolition and offsite disposal.

2. BACKGROUND INFORMATION

The overall plan for the Site is to demolish the above grade structures of the main Willgoos facility. However, portions of the concrete structure of the X-208 through X-210 test cells and exhauster tunnels will remain in place below grade following the completion of Site demolition activities. Demolition of the above-grade Site structures was previously performed. Demolition of portions of Site buildings above or near the X-208 through X-210 test cells exhauster tunnels required that the below grade portions of the tunnel structures be backfilled to provide adequate support for the demolition equipment. Remediation of PCB impacts within the exhauster tunnel outside of the building footprint and associated below-grade structures was performed prior to backfilling. A general description of the Site and Project Area are presented below.

2.1 Site Location and Description

The Site, located on Pent Road in East Hartford, Connecticut, in Hartford County, is owned by Pratt & Whitney Aircraft Division of UTC. The Site is bounded by:

- to the north formally by the Texaco Oil Company Bulk Tank Farm; currently by Goodwin College
- to the east by High Street followed by residential properties and a new magnet school;
- to the south by the High Court Apartment Complex and residential properties; and
- to the west by the Connecticut River.

Based on a review of the Town of East Hartford Zoning Summary Map, dated August 1999 and maintained by the Town of East Hartford, zoning for the Project Area is designated as I-3, industrial. The areas surrounding the Project Area to the south, southeast, east, and northeast are zoned for a mixture of residential and business use. Some land uses of note within two miles of the Project Area include six schools, ranging from elementary to college level, three parks, and at least two cemeteries.

2.2 Environmental Setting

This section describes the general physical and environmental setting of the Site and surrounding area. The Site is situated approximately 40 feet above mean sea level (MSL), and local topography generally slopes to the west toward the Connecticut River, which abuts the western boundary of the Site.

Surficial soil material covering the Site has been identified as primarily the Udorthents-Urban Land Complex, according the United States Department of Agriculture (USDA) (USDA, 2004). The Udorthents-Urban Land complex consists of areas that have been altered by cutting and filling, and impervious areas. These areas are typically used for highways, interchanges, and closely-spaced residential housing. New Haven and Enfield Soils with 0 to 3 percent slopes cover four acres of the Site on the northern end and are considered non-wetland soils. A strip of Winooski Silt Loam, a floodplain soil, borders the Connecticut River on the Project Area's western side. ({Connecticut Department of Energy & Environmental Protection} CTDEEP, 1995; USDA, 2004).

Characterization of the hydrogeology of the Site has been limited to the upper zone of the unconsolidated aquifer. The available geologic boring logs indicate that the upper aquifer ranges in thickness between 14 to 22 feet below ground. The glaciolacustrine deposits act as a local confining unit and would limit hydraulic communication between the sandier deposits above the silt and clay of the glaciolacustrine materials and deeper zones in the unconsolidated aquifer.

Groundwater flow directions on the Project Area have been calculated based on the measured depth to water in over 100 shallow groundwater monitoring wells at the Project Area. Groundwater elevations, as measured during multiple groundwater monitoring events at on-site monitoring wells between 1995 and 2001, indicate that groundwater flow is generally toward the south in the northeast portion of the Project Area, shifting toward the southwest nearer the Connecticut River.

2.3 Project Area Description

The Project Area is located on the east side of the main Willgoos Laboratory. The Project Area was formerly used for venting of the exhaust from jet engine tests performed in the X-207 through X-209 test cells. Exhaust was conveyed through pipes exiting each of the test cells into the concrete tunnel. The tunnels consist of concrete walls, floors and ceilings at depths of up to 16 feet below ground surface. The X-210 test cell portion of the tunnel is constructed the same as the X-207 through X-209 test cell exhauster tunnels with the exception that it was constructed to a depth of 8 feet below ground surface.

2.3.1 X-207 Test Cell

The X-207 Test Cell was a duct-connected stand comprised of an altitude engine or afterburner component, designed to test full-scale gas-turbine engines, afterburner components test rigs, or any miscellaneous rigs requiring air services.

2.3.2 X-208 Test Cell

The X-208 Test Cell was an altitude chamber, equipped with an altitude test stand, designed for testing full-scale gas-turbine engines, afterburner component test rigs, and miscellaneous test rigs. Air required to operate the engine could be drawn directly from the atmosphere through the inlet ducting system or supplied under pressure from the Willgoos Laboratory air compressor units. The inlet air could be cooled through the Willgoos Laboratory air refrigeration system or heated through the atmospheric inlet heater located outside the laboratory building. Engine exhaust could be discharged to the internal powerhouse exhauster units or to the exhauster silencer pit located east of the Willgoos Laboratory building.

2.3.3 X-209 Test Cell

The X-209 Test Cell was a gas-turbine engine test facility used to develop turbojet and turbofan engines and individual afterburner component rigs under simulated altitude and flight speed conditions. Air required to operate the test engine could be drawn directly from the atmosphere through the inlet ducting system or supplied under pressure from the Willgoos Laboratory air compressor units. The inlet air could be cooled through the Willgoos Laboratory air refrigeration system or heated through two Todd Burners located adjacent to the test cell. Engine exhaust could be discharged to the exhauster units situated within the internal powerhouse of the Willgoos Laboratory or to the exhauster silencer pit located east of the Willgoos Laboratory building.

2.3.4 X-210 Test Cell

The X-210 Test Cell was a full-scale engine test stand designed to test gas-turbine engines at simulated sea-level or altitude flight conditions up to Mach 3 where the entire engine was not required to be enclosed in an altitude chamber.

2.4 Building Material Sampling Summary

During the time frame between October 2009 and April 2013 investigation and remediation activities were conducted within the Project Area by AECOM, Loureiro, United Industrial Services, Inc. (UIS) and Clean Harbors Environmental Services, Inc. (Clean Harbors). Investigation activities included: building material sampling, concrete chip sampling, soil sampling and sediment sampling. Based on the results of the investigations described below, remedial activities which included the removal of PCB-containing building materials (i.e., caulk and mastic), removal of PCB-impacted concrete and PCB impacted soil.

During the investigations of the exhauster tunnels and basements by AECOM, PCB-containing building material (mastic) was identified on a portion of the south wall of the X-208 Test Cell Exhauster Tunnel at a maximum concentration of 60.3 milligrams per kilogram (mg/kg). In addition PCB-containing building material (caulk) was identified along the entire southern and western walls and a portion of the northern wall of the X-210 Test Cell basement wall at a maximum concentration of 9,020 mg/kg.

2.5 Potential PCB Sources

The source(s) of the PCBs identified in the X-208 through X-210 Test Cell Exhauster Tunnels are not definitively known. However, three potential sources have been identified and include the following:

- PCBs have been detected in paint on the walls of the test cells in this area at concentrations ranging from 7.08 to 147 mg/kg. Peeling paint has been observed in the X-207, X-208 and X-209 Test Cells and may have been transported through the test cell exhauster pipes to the tunnel by rainwater, which may have entered the building.

- Caulk was found along the entire southern and western walls of the X-210 Test Cell basement and portions of the northern wall with a total PCB concentration of 9,020 mg/kg. This caulk was placed on joints between the walls and ceiling and walls and concrete support columns along the southern and western walls. Limited quantities of the same caulk were found along a portion of the northern wall in the joints between the walls and ceiling.

- Mastic was found along the southern wall of the X-208 Test Cell Exhauster Tunnel near the main Willgoos Laboratory building. This material was placed along the joints between the wall and ceiling, wall and floor, and at locations between walls where there was a bend in the structure. The mastic material had a total PCB concentration of 60.3 mg/kg.

3. BUIILDING MATERIAL REMOVAL ACTIVITIES

Between April 2011 and April 2013, Clean Harbors, Loureiro, and UIS under contract to Pratt & Whitney, completed the removal activities for PCB-containing building materials and PCB-contaminated concrete in the Project Area. Post removal sampling and waste management are discussed in later sections of this report.

3.1 X-208 Test Cell Exhauster Tunnel Mastic Removal

Based on analytical information obtained from investigations of the Project Area performed by AECOM, PCBs were detected in mastic along the southern wall of the X-208 Test Cell Exhauster Tunnel near the main Willgoos Laboratory building. This material was located along the joints between the wall and ceiling, wall and floor, and at locations between walls where there was a bend in the structure. The mastic material had total PCB concentrations greater than 10 mg/kg.

In May 2011, approximately 86 linear feet of mastic coating was removed from a section of the southwest concrete wall of X-208 Test Cell Exhauster Tunnel. The mastic and concrete were removed b Clean Harbors via scarification to an approximate depth of 1/16 to 1/8 of an inch and the resulting waste material was disposed of offsite as PCB bulk product waste.

3.2 X-208 Test Cell Exhauster Tunnel Caulk Removal

Based on analytical information obtained from investigations of the Project Area performed by AECOM, PCBs were detected in caulk and concrete along the south, west and portions of the north wall of the Project Area at concentrations greater than 10 mg/kg. In December 2011 approximately 210 linear feet of caulk and the surrounding concrete were manually removed and the resulting waste material was disposed of offsite as PCB bulk product waste.

3.3 X-208 Test Cell Exhauster Tunnel Concrete Removal

Between March 28, 2013 and April 7, 2013, Loureiro under contract to Pratt & Whitney, completed the removal activities in the Project Area. Approximately 93 cubic yards of concrete were removed from the southern, western, and portions of the northern walls of X-210 Test Cell Exhauster Tunnel as well a small portion of the floor for offsite disposal as PCB remediation waste. Due to the complete removal of the contaminated walls no confirmatory concrete chip samples were collected as part of this activity.

4. POST REMOVAL SAMPLING

Removal activities were accomplished either by scarification or complete removal of the subject material (i.e. caulk, mastic, or PCB-contaminated concrete). Following the completion of the scarification activities, confirmatory concrete samples were collected of the affected areas. Confirmatory samples of concrete were collected to confirm that residual PCB concentrations did not exceed 1 mg/kg if the removal area was within 4 feet of the ground surface or 10 mg/kg if the removal area was deeper than 4 feet below ground surface. Confirmatory concrete sampling was performed to document the adequacy of the removal measures as performed at the Project Area. A summary of the sampling and analytical information is described below.

4.1 X-208 Test Cell Exhauster Tunnel Mastic Removal

On May 24, 2011, Loureiro personnel collected 17 concrete chip samples (NW-CC-607 through NW-CC-623) from the area in which mastic and underlying concrete were removed from within the X-208 Test Cell Exhauster Tunnel. The sampling locations are shown on the attached Figure 4-1.

Verification sampling upon the completion of the mastic removal was performed in accordance with Title 40 of the Code of Federal Regulations (CFR) Part 761 Subpart O. As the mastic did not cover a large area, but was linear in nature post removal samples were collected every 5 lineal feet from the 86 lineal feet of mastic removed area. Concrete chip samples were collected from the surface to a depth of 0.5 inches using an impact hammer drill equipped with a 0.875-inch carbide bit. Concrete sampling activities were completed in accordance with the Loureiro Standard Operating Procedure (SOP) identification #10001, entitled, *Concrete Chip Sampling* and included in Appendix A.

Each concrete chip sample submitted for laboratory analysis was placed into glass jars provided with Teflon®-lined caps and transported in an iced cooler under chain-of-custody control to Accutest Laboratories (Accutest) of Marlborough, Massachusetts. The concrete samples were submitted for analysis for PCBs by United States Environmental Protection Agency (EPA) Method 8082 by Soxhlet extraction. A summary of sampling and analytical information for the confirmatory sampling is included as Table 4-1.

PCBs were detected in 3 of the 17 concrete chip samples submitted for laboratory analysis. PCBs were detected at concentration of 0.348 mg/kg, 0.284 mg/kg, and 0.473 mg/kg in the concrete chip samples collected from sampling locations NW-CC-612, NW-CC-615, and NW-

CC-618, respectively. A summary of PCBs detected in the confirmatory samples is included in Table 4-2. The analytical data as received from the laboratory is included in Attachment B.

PCBs were detected at concentrations less than 1 mg/kg in the concrete chip samples collected from the area of mastic removal indicating the successful removal of PCB containing mastic from the wall and thus no further removal actions were necessary.

4.2 X-208 Test Cell Exhauster Tunnel Caulk Removal

On January 20, 2012, Loureiro personnel collected a total of 42 confirmatory concrete chip samples (NW-CC-685 through NW-CC-727) from the 210 linear feet of removed caulk and underlying concrete along the south wall of the Project Area and a small portion of the north wall. Concrete chip samples were collected every 5 lineal feet from the area of removed concrete.

The concrete chip samples were collected from the surface of the concrete to a depth of 0.5 inches using a hammer drill with a 0.75-inch diameter bit and gathering the concrete powder and chips into glass jars with Teflon®-lined caps for laboratory analysis on a 5 foot by 5 foot grid spacing over the entire area. The concrete chip samples were transported in an iced cooler under chain of custody control to Spectrum Analytical, Inc. (Spectrum) of Agawam, Massachusetts. The samples were submitted for analysis for PCBs by EPA Method 8082 by Soxhlet extraction. A summary of sampling and analytical information for the confirmatory samples is included as Table 4-3. The analytical data as received from the laboratory is included as Attachment B. The concrete chip sampling locations are shown on Figure 4-2.

PCBs were detected in each of the concrete chip samples submitted for analysis. PCBs were detected in concrete chip samples at concentrations ranging between 2.54 mg/kg to 1,924 mg/kg. PCBs were detected at concentrations greater than 50 mg/kg in 30 of the 42 samples submitted for analysis. PCBs were detected at concentrations between 10 mg/kg and 50 mg/kg in 7 of the 42 samples submitted for analysis and the remaining 5 concrete chip samples had concentrations of PCBs between 1 mg/kg and 10 mg/kg with only three of these sampling locations (NW-CC-693, NW-CC-695, and NW-CC-726) within four feet of the ground surface. A summary of PCBs detected in the confirmatory samples is included as Table 4-4. As the result of these confirmatory sampling results, the concrete removal activities were performed as discussed in Section 3.3.

4.3 X-208 Test Cell Exhauster Tunnel Delineation

Based on the analytical information obtained during X-208 Exhauster Tunnel Caulk Removal, it was determined that the entire south and west walls of the Project Area would be physically removed and properly disposed of offsite as a PCB remediation waste.

On March 28, 2013, LEA personnel collected eight concrete chip samples from the north wall and floor of the Project Area in an effort to further delineate the extent of PCB-impacted concrete. Based on the analytical data obtained during AECOM's investigation of the Project Area, PCBs were detected at concentrations between 1 mg/kg and 10 mg/kg in multiple concrete chip samples which were collected from the walls approximately 18 inches off of the floor. In an effort to delineate the extent of PCB impacted concrete in the vicinity of the AECOM wall sample locations, concrete chip sample locations NW-CC-1838 and NW-CC-1839 were collected from immediately below the areas marked for possible removal by AECOM on the north wall of the Project Area. In addition, concrete chip sampling locations NW-CC-1840 through NW-CC-1844 were collected from the concrete floor of the Project Area on 5-foot offsets from the AECOM sampling location in which PCBs were detected at greater than 50 mg/kg. Figure 4-3 depicts the sampling locations.

The concrete chip samples were collected from the surface of the concrete to a depth of 0.5 inches using a hammer drill with a 0.75-inch diameter bit and gathering the concrete powder and chips into glass jars with Teflon®-lined caps for laboratory analysis on a 5 foot by 5 foot grid spacing over the entire area. The concrete chip samples were transported in an iced cooler under chain of custody control to Spectrum. The samples were submitted for analysis for PCBs by EPA Method 8082 by Soxhlet extraction. A summary of sampling and analytical information for the concrete samples is included as Table 4-5. The analytical data as received from the laboratory is included as Attachment B.

PCBs were detected in each of the eight concrete chip samples submitted for analysis. PCBs were detected at concentrations of 0.097 mg/kg and 0.0625 mg/kg at sampling locations NW-CC-1838 and NW-CC-1839, respectively. PCBs were detected at concentrations ranging from 0.558 mg/kg to 1.31 mg/kg from concrete chip sampling locations NW-CC-1840 through NW-CC-1844. A summary of PCBs detected in the concrete samples is included as Table 4-6

Based on the analytical data collected from the delineation sample locations, the total square footage of flooring that will be removed for offsite disposal was approximately 50 square feet in the immediate vicinity of the AECOM floor sample. In addition, none of the north wall of the Project Area in the vicinity of concrete chip sample locations NW-CC-1838 and NW-CC-1839 required removed.

5. WASTE MANAGEMENT

Demolition materials were separated into two different waste streams for disposal purposes, PCB Bulk Product Waste for those building materials containing PCBs at concentrations greater than 50 mg/kg or in contact with PCBs at concentrations greater than 50 mg/kg (i.e., painted concrete) and PCB Remediation Waste for those materials determined to have been impacted by spills of liquid PCBs with concentrations greater than 50 mg/kg and those materials where an attempt was made to removethe PCB Bulk Product Waste from the underlying substrate.

During the removal activities approximately ???? tons of PCB Bulk Product Waste were shipped off-site for disposal. PCB Bulk Product Waste materials were handled by Red Technologies and transported to ???? for disposal. During the remediation activities approximately 93 cubic yards of concrete, were shipped off-site for disposal as PCB Remediation Waste. PCB Remediation Waste materials were transported to Model City, a Waste Management facility in Model City, New York and Wayne Disposal an Environmental Quality Company disposal facility in Belleville, Michigan. A summary of the waste management activities including the origin and quantities is included in Appendix D.

TABLES

FIGURES

APPENDIX A

Sampling Standard Operating Procedures

APPENDIX B

Analytical Data

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Waste Management Summary